REMARKS

Claims 38-84 and 87-100 are pending in the application.

Objection to the Specification

The disclosure is objected to because of an informality.

Regarding application 09/104,171, a search has been conducted on the U.S. PATENT AND TRADEMARK OFFICE database. The result of the search indicates that there are 0 patents assigned with this application number. It is apparent that this application still has not been given a patent number. A copy of the search result is attached herewith as addendum A.

Claim Objections

Claims 51, 54, 55, 72, 75-76 and 81-84 are objected to because of minor informalities.

The claims have been amended, as needed, to overcome this rejection. Reconsideration and withdrawal of this rejection are respectfully requested.

Claim Rejections under 35 USC §112

Claims 51, 72, 83-34, 89 and 93 are rejected under 35 USC §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Enclosed herewith in Addendum B is an enlarged view of FIG. 29. As shown in the

enlarged view, the sealing portion (sealing member 200) is provided between portion A (marked in green) and portion B (marked in pink). Portion A of the stator is caused to be rotated with a rotating element by an abnormal torque, and portion B is not rotated with the rotating element by said abnormal torque and is stationary. Thus, the subject matter of claims 51, 72 and 83 is disclosed in FIG. 29 and the associated written specification.

In claims 88 and 92, a cooling device corresponds to a cooling pipe 206 shown in FIGS. 29 and 30.

In claims 89 and 93, another cooling device is defined. This another cooler device is supported in the original specification for the following reason.

In the original specification, the following description is made:

> In this embodiment, heater or cooling pipe can be attached or heat transfer members can be incorporated to inner casing 152 or its auxiliary elements so that necessary localized temperature control is provided at desired location of the pump. It can prevent generation of byproduct material within the pump during specific processes thereby to expand the operational range of the pump. (See page 38, lines 17-23).

As is apparent from the above, another cooling pipe is provided in the embodiment as shown in FIG. 29. In this case, the cooling pipe is attached to inner casing 152 or its auxiliary elements. Inner casing 152 comprises a lower inner casing 150 and an upper inner casing 153, and its auxiliary elements include the base section 15 which is provided adjacent to the lower inner casing 150. Since the base section 15 constitutes a part of the stator S and is located at the bottom portion of stator S, "another cooling device is provided at a downstream side of said cooling device" and is supported in the original specification. Further, as shown in FIG. 29, a pipe is provided on

the base section 15, and this pipe corresponds to another cooling device. Thus, the another cooling device is supported not only in the written specification but also in FIG. 29.

Claims 44-46, 51, 65-67, 72, 83-84, 89 and 93 are rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Numerous claims are amended, as needed, to overcome this rejection.

Regarding claims 45-46, the antecedent basis appears in claim 44, line 2.

Reconsideration and withdrawal of this rejection are respectfully requested.

Claim Rejections under 35 USC §102

Claims 38, 42, 43, 51, 57, 59, 63-64, 72, 78 and 83 are rejected under 35 USC §102(b) as being anticipated by German Patent 2,214,702.

Claims 38, 42, 43, 51, 57 and 83 are rejected under 35 USC §102(b) as being anticipated by German Patent 3,402,549 (figure 1).

Claims 38, 42, 43, 51, 58, 59, 63-64, 72, 79 and 83 are rejected under 35 USC §102(b) as being anticipated by Deters (U.S. Patent No. 4,797,062 (figure 1).

The following is the process through which the Inventor tackled the above-mentioned issues, or how to establish the safety measure to minimize the effect of an abnormal torque which is generated and transmitted from the rotor to the stator of the turbomolecular pump.

As one of many safety measures, the Inventor originated a method to reduce the torque generated and transmitted from the rotor to the stator, wherein the stator rotates inside the pump casing. As the stator rotation consumes the rotor's rotational energy, torque generated by the rotor is decreased.

The Inventor made an assumption that setting the stator free from the pump casing first is necessary to rotate the stator; thus, the Inventor invented the constriction releasing structure.

To rotate the stator after releasing constriction, the Inventor made an assumption that it would be effective to reduce friction between the pump casing and the stator as much as possible.

However, as written in the attached document, the impact force to the stator upon the rotor breakdown is quite large and can become a momentary and excessive impact force.

Thus, even if the structure is modified from the aspect of the stator rotation against the pump casing, the large impact force can generate a large frictional force between the pump casing and the stator and eventually disturbs the stator rotation. The Inventor has found this fact through repeated performance of basic tests.

Based on a basic idea that friction is a phenomenon caused by having an object being in contact with another object, the Inventor defined a state in which objects do not come in contact with each other as an ultimate non-friction state. Then, the Inventor originated an idea to create a clearance between the pump casing and the stator where no objects are in contact with one another.

In addition, the Inventor made an assumption that the clearance would be effective to prevent the momentary and excessive impact force from being transmitted from the stator to the pump casing.

The Inventor also assumed that the clearance would become an effective space to release constriction in the constriction releasing structure.

Next, to determine the optimal size of the clearance, the Inventor originated a concept of an impact absorbing structure, which structure absorbs impact force, wherein the clearance between the pump casing and the stator can be maintained even when such an excessive impact force is received upon a rotor breakdown, thus minimizing transmission of the impact, and decreasing friction as much as possible.

Also, the clearance and adopting a part of the rotational system of the stator to the pump casing have ensured that the stator would rotate against the pump casing.

As described above, the initial purpose to reduce the generated torque from the rotor to the stator by rotating the stator inside of the pump casing has been accomplished by inventing the clearance between the pump casing and the stator.

Thus, the clearance created in the present invention is fundamentally significant and ground breaking.

The clearance in the present invention is fundamentally different from German Patent, 2,214,702, German Patent 3,402,549 and Deters 4,797,062. Clearances described in both German prior art are created for the necessity of the manufacturing process and cost reduction by not being concerned with machining accuracy.

A clearance described in Deters is created for preventing heat transmission caused by being in contact with each other.

Thus, all clearances in the examples described above are created from the static point of

view, focusing on the structure.

In contrast, the clearance of the present invention is created by the dynamic point of view of focusing on the impact and frictional forces being generated and transmitted from the rotor, which rotates at a high speed, to the stator upon an abnormal torque generation. That is, the clearance in the present invention is different in nature from the clearances provided in the prior art examples.

Although both the present invention and the prior art examples have a clearance between the pump casing and the stator, creation of the clearance of the present invention comes from paying attention to behaviors of each component and parts inside of the pump casing when an abnormal torque is generated and transmitted from the rotor to the stator.

In other words, the clearance in the present invention is intended to reduce the impact and frictional forces, which are transmitted regardless of whether the stator is in contact with the pump casing or not, and eventually to reduce the impact force and torque transmission to the pump casing upon rotor failure, and its effect is more properly and securely appreciated by the stator's constriction releasing structure and rotational system. The clearance should be distinguished from those described in other prior arts.

In the prior art examples, when an abnormal torque is generated and transmitted from the rotor to the stator, a part of the clearance between the pump casing and the stator is surely and immediately lost, causing the stator to come in contact with the pump casing, stopping the stator rotation against the pump casing, thus transmitting an excessive torque caused by the impact and frictional forces to the pump casing, eventually damaging or fracturing not only the pump casing itself but also any pipes connecting to any equipment outside of the pump.

In addition, the prior art examples have no description about the purpose set in the present invention, that is, to reduce the impact force and torque transmission to the pump casing when an abnormal torque is generated and transmitted from the rotor to the stator; therefore, it is obvious that they do not teach or suggest the present invention.

Claim 59 is rejected under 35 USC §102(b) as being anticipated by Japanese Patent 59-153,988 (figure 2).

This prior art is related to an "installation device" for a vacuum rotational machine (embodiment: turbomolecular pump), not a turbo molecular pump itself equipped with an exhaustion function.

Actually, FIG. 2 shows that the vacuum rotational machines 14 (embodiment: turbomolecular pump 30) are connected so that the exhaust paths are aligned in series, and are installed inside of the installing housing 10.

The suction pipe 50, which is connected to these multiple vacuum rotational machines 14 and the vacuum container 5 to be evacuated and located outside, is led to the suction chamber 42 formed in the upper lid 12 of the installing housing 10.

Similarly, the exhaust pipe 51, which communicates with the exhaust chamber 46 formed in the upper lid 12 of the installing housing 10, is connected to other vacuum machines, such as a roughing pump, equivalent to reference numeral 8 in FIG. 1.

The exhaust path from suction to exhaustion comprises only the upper lid 12 and the vacuum rotational machines 14, and does not exist in a space which is formed by the inside of the installing housing 10 and the outside of the vacuum rotational machines 14 as is pointed out in the outstanding Office Action.

This space is evacuated through exhaust pipe 22 by another pump (negative pressure source), which is different from the above exhaust path, and the space 7 is maintained at a negative pressure.

According to this structure, the installing housing 10 is not capable of functioning as a vacuum pump, and does not have any exhaust path which allows the interior space of the installing housing 10 to be exhausted by itself.

In this prior art example, the vacuum pump or turbomolecular pump is definitely the vacuum rotational machine 14 installed in the installing housing 10.

In addition, the pump casing of this vacuum rotational machine is shown by reference numeral 25.

Also, the stator of this vacuum rotational machine is shown by reference numeral 31.

Therefore, this prior art example does not disclose a clearance between the pump casing and the stator, but discloses a space between the installing housing 10 and the pump casing 25.

Claims 59-69, 73-74 and 76 are rejected under 35 USC §102(b) as being anticipated by Japanese Patent 6-40954 (figure 1).

The response made to an obviousness rejection based on Japanese Patent 6-40954 in view of Schutz is incorporated herein without being redundantly reproduced herein. Reconsideration is respectfully requested.

Claim 80 is rejected under 35 USC §102(b) as being anticipated by Japanese Patent 63-223,394 (figure 1).

Claim 80 is rejected under 35 USC §102(b) as being anticipated by Japanese Patent 3-124,998 (figure 1).

Claim 80 is rejected under 35 USC §102(b) as being anticipated by Japanese Patent 62-29,796 (figure 1).

Amended claim 80 includes a feature, "wherein said temperature adjusting mechanism is attached to a spiral groove pumping section spacer."

All cited references, JP63-223394, JP3-124998, and JP62-29796 fail to disclose the above feature of claim 80. Specifically, JP63-223394 discloses a water jacket provided around the vane pumping section, JP3-124998 discloses cooling fins 9/cooling gas inlet 10 provided around the vane pumping section, and JP62-29796 discloses a vessel 11 provided around the vane pumping section.

Claims 85-87 are rejected under 35 USC §102(e) as being anticipated by Okamura (U.S. Patent 5,924,841 (figure 2)).

Claims 85-87 are rejected under 35 USC §102(b) as being anticipated by Japanese Patent 2557551 (figure 1).

Claims 85-87 are rejected under 35 USC §102(b) as being anticipated by Japanese Patent 9-72,293 (figure 2).

Claims 85-86 are canceled without prejudice, rendering any rejection applied thereto moot.

In claim 87, a heating source is provided at a lower end portion of the stator of the groove pumping section.

However, US 5,924,841 and JP9-72293 disclose a heater 14 (corresponding to a heating source in claim 87) provided outside of casing 1. Reference numerals 16 and 17 represent a bulkhead and a good heat conductor, respectively. The bulkhead 16 consisting of a heat transfer body and the good heat conductor 17 are not a heat source but rather a heat transfer member.

Further, JP2557551 discloses a heating portion comprising nichrome wires 17, 18 provided at a location outwardly of the groove pumping section and a location inwardly of the groove pumping section, respectively.

Claim Rejections under 35 USC §103

Claim 49 is rejected under 35 USC §103(a) as being unpatentable over either German Patent 2,214,702 or German Patent 3,402,549 in view of Schutz (U.S. Patent No. 5,577,883).

Claim 70 is rejected under 35 USC §103(a) as being unpatentable over German Patent 2,214,702 in view of Schutz (U.S. Patent 5,577,883).

The shortcomings of the German Patents are addressed in response to a separate rejection. That response is incorporated herein without being redundantly duplicated herein. Due to these cited shortcomings, even if the references are combined, the claimed rejection will not result. Therefore, the claimed invention is not rendered obvious by these references. Reconsideration and withdrawal of this rejection are respectfully requested.

Claim 75 is rejected under 35 USC §103(a) as being unpatentable over Japanese Patent 6-40954 in view of Schutz (U.S. Patent 5,577,883).

Japanese patent 6-40954 (JP6-40954) discloses that the stator (3b) of a spiral groove vacuum pump section (3) is provided slidably in a circumferential direction in the housing (1) to solve a problem C described later under conditions A and B (quoted from JP6-40954 which corresponds to JP1-113191 and translated into English) below.

Conditions

(A) "According to a spiral groove vacuum pump, in view of its discharge principle, a clearance between an outer surface of a rotor and an inner surface of a stator is generally extremely narrow such as 0.2 through 1.0 mm at a minimum portion thereof."

(B) "Further, mass of the rotor reaches several times as much as that of a rotor of a turbo-molecular pump having the same outer diameter and is rotated at high speed at several ten thousands rotation per minute."

Problem

(C) "However, according to the conventional spiral groove vacuum pump, as described above, the stator (d) is fixed in the housing (a) and accordingly, in the worst case in which foreign matters are entrapped in the clearance or byproducts are deposited in the clearance by CVD process or the like, there is a concern in which the rotor is instantaneously locked in a steady-state rotation at several ten thousands rotation per minute and in the case of instantaneous locking, kinetic energy provided to the rotor constituting a high-speed rotating body having large mass is dissipated as torsion by the side of the stator and there is a concern of destructing the housing along with the stator."

Contrary, in the present invention, (i) "a clearance is formed between said stator and said casing portion," (ii) "so that, when an abnormal torque is applied from said rotor to said stator, at least a part of said stator is allowed to rotate." Note that "said stator" corresponds to the stator (3b) and "said casing portion" corresponds to the housing (1) in JP6-40954. Thus, in the aspect of (i), the present invention is essentially different from JP6-40954.

The Office Action points out "fitting clearance near 5 formed between the stator 3b and casing portion 2"; however, JP6-40954 does not disclose such a "clearance."

In JP6-40954, the stator (3b) is supported by an upper ridge (1c) and a lower ridge (1d) of a tube-shaped supporting body (1a) constituting a portion of housing (1) slidably in a circumferential direction via sliding members (6a) and (6b) at an upper end face and a lower end face thereof. There is no "unnumbered fitting clearance near 5" between the stator (3b) and the casing portion (2). Although the Examiner regards the casing portion in JP6-40954 as reference numeral 2, the reference numeral 2 represented a turbo molecular pump section. The casing portion of the present invention

corresponds to housing (1) of JP6-40954. Thus, JP6-40954 does not disclose that "a clearance is formed between said stator and said casing portion, so that, when an abnormal torque is applied from said rotor to said stator, at least a part of said stator is allowed to rotate."

Reference numeral 1a in JP6-40954 represents a tube-shaped supporting body, constituting a part of housing, which corresponds to the stator of the present invention. In addition, although the Examiner regards the member represented by reference numeral 3 as "inner casing," the reference numeral 3 represents the spiral groove vacuum pump section, comprising a spiral-groove (3a) of a rotor (4) and a cylindrical stator (3b) facing the spiral groove (3a) with a very small clearance (5). Although the Office Action states, on page 9 of the Office Action, that the inner casing 3 surrounds the stator, with a small fitting clearance between the inner casing and the casing portion, there is no such small fitting clearance in JP6-40954.

The essential purpose of JP6-40954 is to avoid the pump operation failure due to foreign matters or byproducts in a very small clearance formed between th rotor (4) and the stator (3b). No clearance is formed between the housing (1) and th stator (3b) in JP6-40954. Specifically, when the problems described above have occurred, the stator (3b) is allowed to rotate by such a structure that the stator (3b) is supported by the upper ridge (1c) and the lower ridge (1d) of the tube-shaped supporting body (1a) slidably in a circumferential direction via the sliding members (6a) and (6b). Thus, JP6-40954 does not disclose that when an abnormal torque is applied from the rotor to the stator, the clearance prevents the abnormal torque for being transmitted to the pump casing.

In JP6-40954, the sliding members (6a) and (6b) are provided to make rotation of the stator (3b) easier. These sliding members (6a) and (6b) are located on the top and bottom end surfaces of

the stator (3b) so that they are held against the top and bottom ridges (1c) and (1d) of the tube-shaped supporting body (1a) which constitutes a part of the housing. Thus, JP6-40954 neither discloses nor suggests the clearance at all which is intended to create an ultimate friction-free state "where no objects are in contact with each other" and to "prevent the force from being transmitted."

Accordingly, the present invention patentably distinguishes over JP6-40954.

Double Patenting Rejection

Claims 38 and 49 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 7 and 7, respectively, of U.S. Patent No. 6,332,752 in view of Schutz (U.S. Patent 5,577,883).

Claims 59, 60, 61, 62 and 70 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 10, 10, 13, 11, and 10, respectively, of U.S. Patent 6,332,752, in view of Schutz (U.S. Patent 5,577,883).

Claims 59-69,73-74 and 76 are all rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 34 of U.S. Patent No. 6,332,752 in view of Japanese Patent 6-40954.

Claim 75 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 34 of U.S. Patent 6,332,752 and Japanese Patent 6-40954 as applied to claim 73 above and further in view of Schutz (U.S. Patent No. 5,577,883).

A disclaimer is being filed concurrently herein to disclaim all claims cited for double patenting. Reconsideration and withdrawal of these rejections are respectfully requested.

By so amending all pending claims are placed in condition for allowance. Reconsideration and withdrawal of this rejection are respectfully requested.

Allowable Subject Matter

The allowance of claim 88, 90-92 and 94-99, and the indication of allowable subject matter of claims 81-82, 39-41, 47-48, 50, 52-56, 71, 77 and 44-46 are noted with appreciation.

English Translations of Foreign References

The Office has cited JP 59-153988 written in Japanese, DE 3402549 and DE 2214702 written in German. To properly understand these references, the Applicant translated them into English. English translations of these references are submitted herewith for the convenience of the Office.

Conclusion

In view of the aforementioned amendments and accompanying remarks, all of the pending claims are in condition for allowance, which action, at an early date, is requested.

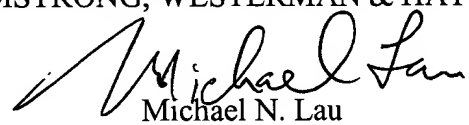
If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN & HATTORI, LLP



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Enclosures: Version with markings to show changes made
Addendum

Q:\FLOATERS\MLAU\991517\AMENDMENT 4-28-03

VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/473,137

IN THE CLAIMS:

Amend claims 43-46, 51, 54, 55, 65-67, 72, 75, 76, 80, 81, 83, 85, 86, 89 and 93, as follows:

43. (Amended) A turbo-molecular pump according to claim 38, further comprising an impact absorbing structure provided in said casing portion.

44. (Amended) A turbo-molecular pump according to claim 43, wherein said impact absorbing structure comprises an inner casing surrounding said vane pumping section and/or said groove pumping section.

45. (Amended) A turbo-molecular pump according to claim 43, wherein said impact absorbing structure comprises a friction reducing mechanism provided between an inner casing surrounding said vane pumping section and/or said groove pumping section, and said stator or said casing portion.

46. (Amended) A turbo-molecular pump according to claim 43, wherein said impact absorbing structure comprises an impact absorbing member provided between an inner casing surrounding said vane pumping section and/or said groove pumping section, and said stator or said casing portion.

51. (Amended) A turbo-molecular pump according to claim 38, further comprising:

a sealing portion provided between a portion of said stator which is caused to be rotated with a rotating element by said abnormal torque, and a portion which is not rotated with the rotating element by said abnormal torque and is stationary.

54. (Amended) A turbo-molecular pump according to claim 52, wherein said inner casing and/or said casing portion is comprised [by] of a high thermal conductivity material.

55. (Amended) A turbo-molecular pump according to claim 38, wherein said vane pumping section and/or said groove pumping section stator is attached to said casing portion by way of a friction reducing mechanism.

65. (Amended) A turbo-molecular pump according to claim 63, wherein said impact absorbing structure comprises an inner casing surrounding said vane pumping section and/or said groove pumping section.

66. (Amended) A turbo-molecular pump according to claim 65, wherein said impact absorbing structure comprises a friction reducing mechanism provided between said inner casing, and said stator or said casing portion.

67. (Amended) A turbo-molecular pump according to claim 65, wherein said impact absorbing structure comprises an impact absorbing member provided between said inner casing, and said stator or said casing portion.

72. (Amended) A turbo-molecular pump according to claim 59, further comprising:

a sealing portion provided between a portion of said stator which is caused to be rotated with a rotating element by said abnormal torque, and a portion which is not rotated with the rotating element by said abnormal torque and is stationary.

75. (Amended) A turbo-molecular pump according to claim 73, wherein said inner casing and/or said casing portion is comprised [by] of a high thermal conductivity material.

76. (Amended) A turbo-molecular pump according to claim 59, wherein said vane pumping section and/or said groove pumping section stator is attached to said casing portion by way of a friction reducing mechanism.

80. (Amended) A turbo-molecular pump comprising:

a casing portion housing a stator and a rotor therein;

a vane pumping section and/or a groove pumping section comprised by said stator and said rotor and said rotor;

an inner casing surrounding said vane pumping section and/or said groove pumping section; and

a temperature adjusting mechanism provided inside said inner casing;

wherein said temperature adjusting mechanism is attached to a spiral groove pumping section spacer.

81. (Amended) A turbo-molecular pump comprising:

a casing portion housing a stator and a rotor therein, said stator surrounding said rotor;

a vane pumping section and/or a groove pumping section comprised by said stator and said rotor;

an inner casing portion surrounding said stator;

a clearance provided between said inner casing portion and said casing portion; and

a sealing portion provided between a portion of said inner casing portion or said stator which is caused to be rotated with a rotating element by an abnormal torque which is applied from said rotor to said stator, and said casing portion which is not rotated with the rotating element by said abnormal torque and is stationary.

83. (Amended) A turbo-molecular pump comprising:

a casing portion housing a stator and a rotor therein, said stator surrounding said rotor;

a vane pumping section and/or a groove pumping section comprised by said stator and said rotor; and

a sealing portion provided between a portion of said stator which is caused to be rotated with a rotating element by an abnormal torque which is applied from said rotor to said stator, and a portion which is not rotated with the rotating element by said abnormal torque and is stationary.

89. (Amended) A turbo-molecular pump according to claim 88, wherein another cooling device is provided at a downstream side of said cooling device.

93. (Amended) A turbo-molecular pump according to claim 90, wherein another cooling device is provided at a downstream side of said cooling device.

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APN/09/104,171: 0 patents.

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Add B

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FIG. 29